Ref# 143

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

BARK BEETLE INFESTATION IN PONDEROSA PINE, ROCKY BOY INDIAN RESERVATION, MONTANA

By
James C. Evenden
Entomologist

Forest Insect Laboratory
Coeur d'Alene, Idaho
February 10, 1938

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Note by [illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR

OFFICE OF INDIAN AFFAIRS

WASHINGTON

March 18, 1938

Dr. F. C. Craighead
Department of Agriculture
Washington, D. C.

Dear Dr. Craighead:

Receipt is acknowledged of your letter of March 15, with which you enclosed Mr. Evenden's report entitled "Bark Beetle Infestation in Ponderosa Pine - Rocky Boy Indian Reservation, Montana".

I have read the report with a great deal of interest and will at my first opportunity see whether or not it is possible for us to so conduct our logging operations on the Rocky Boy Reservation that such operations will not be a contributing factor to the infestation. I note also that Mr. Evenden intends to make a further examination of the area this Spring, and we shall await his report with a great deal of interest.

We are deeply appreciative ofthe interest which Mr. Keen and Mr. Evenden have shown in the protection of Indian lands from insect infestations and greatly respect their advice, and we wish to assure you that we will cooperate with your Bureau to the fullest possible extent in the control of beetle infestations on Indian reservations.

Sincerely yours,

Lee Muck
Director of Forestry

Noted by
RLF
JMW

Refer to file
Project I-5

Forest Insect Laboratory
Coeur d'Alene, Idaho
Feb. 12, 1938

Dr. F. C. Craighead
Washington
D. C.

Dear Dr. Craighead:

There are enclosed two copies of a report covering the bark-beetle infestation in ponderosa pine on the Rocky Boy Indian Reservation of Montana. In this report I have attempted to show at least some of the factors which I believe are responsible for the situation as it existed last season. Ips outbreaks of this character are difficult situations to combat, for instead of directing treatment to the infested trees, my reaction has been that it is necessary to look somewhat deeper in order to determine the reason for the condition. Though we have at times instituted control against some sporadic Ips outbreaks with very good success, I have often wondered as to just what would have happened had no control been instituted. I hope during the coming season to visit this area prior to the removal of the logs from the woods, in order that more specific recommendations can be made as to the part they are playing in subsequent losses. Your comments and suggestions in connection with this situation will be appreciated.

The extra copy enclosed is for transmittal to the Washington office of the Indian Service. As no specific recommendations involving an expenditure of funds have been made, copies have been sent direct to the Superintendent of the Rocky Boy Indian Reservation and to the Indian Service offices at Spokane and Billings, as well as to our western laboratories.

Respectfully yours,

James C. Evenden
Entomologist

Enclosures

BARK BEETLE INFESTATION IN PONDEROSA PINE ROCKY BOY INDIAN RESERVATION, MONTANA

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Introduction

An outbreak of Ips oregoni in the ponderosa pine stands of the Rocky Boy Indian Reservation in northern Montana was reported to the Forest Insect Laboratory at Coeur d'Alene, Idaho in June 1937 and an examination requested. The writer visited this area on June 13, a few days subsequent to an examination by Mr. Harold Weaver, Forest Assistant, Indian Service. The results of both examinations were reported a few days later? This situation was again examined by the writer during August to learn the factors responsible for the outbreak and the possibility of taking some action to prevent further losses.

The timber stands of the Rocky Boy Indian Reservation are confined to the more protected slopes of the Bear Paw Mountains. Ponderosa pine, Douglas fir, lodgepole pine, Engelmann spruce, and aspen comprise the different forest types, with the first-named species being of the greatest economic importance. Though ponderosa pine is found in scattered patches at the lower elevations of all timbered areas, the largest stands are located in Sections 9, 10, 15, and 16; T. 28 N.; R. 15 E. in the vicinity of the Indian sawmill. These stands of pine vary from areas of reproduction to poles and small sawlogs. Large, overmature trees are scattered throughout these areas, providing a very inadequate over-story.

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* Letter to Commissioner of Indian Affairs, Washington, D. C. from Harold Weaver, Forest Assistant June 12, 1937; and Memorandum to Superintendent Woolridge, Rocky Boy Indian Agency by James C. Evenden, Entomologist June 18, 1937.

Though the forests of this reservation are not of a high commercial quality, they are the only timber stands in the northern portion of Montana east of the Rocky Mountains, and are extremely valuable for forest products and recreational purposes.

Bark Beetle Infestation in Ponderosa Pine

In the areas adjacent to the sawmill two species of Ips and the red turpentine beetle have been visually responsible for the destruction of rather large groups of ponderosa pine varying from 4 to 20 inches in diameter. Of the two Ips species the Oregon engraver (Ips oregoni) was in far greater abundance than the western six-spined engraver (Ips pondérosa), with the latter species apparently preferring larger trees for attack. No combined attacks of these two species were recorded. The red turpentine beetle (Dendroctonus valens) had attacked the base of trees subsequently infested with Ips as well as many living ones. In assuming the beetles to be responsible for the death of the trees, which is questionable, it is difficult to establish the primary status of the Ips and turpentine beetle attacks; though in most cases those of the latter species were the initial ones.

Though these three species of bark beetles are considered as secondary in their attacks, preferring dead or dying host material, under favorable conditions they assume at least a more visual primary role. Such aggressiveness may follow a reduction in tree vigor associated with unfavorable climatic conditions or abnormal increases in

beetle populations, and may permit a temporary change from secondary to primary habits of attack. The difficulty of determining the primary status of secondary bark beetles is the question of tree resistance at the time of attack. In an effort to determine the cause of this outbreak of secondary beetles, there would seem to be four factors involved which are of sufficient importance to warrant a somewhat detailed presentation.

1. Marginal Timber Sites

The forests of the Rocky Boy Indian Reservation mark the northern limits of ponderosa pine east of the Continental Divide. Though these marginal areas are not considered as overly favorable for the growing of this tree species, fairly rapid-growing trees are produced on the better sites. However, on the dry, exposed rocky slopes, which is where the insect damage has occurred, the trees are of poorer quality and of much slower growth. In accepting growth as a measurement of tree vigor, the extremely poor increment associated with the poorer sites of this area would place them in a low classification. Obviously, trees growing on such poor sites would be very susceptible to adverse departures from normal conditions.

Increment cores were taken from a number of trees killed in 1937 and from living ones on the same site to determine if the slower-growing trees were more susceptible to beetle attack.

RADIAL GROWTH OF KILLED AND LIVING TREES
GROWING UNDER COMPARABLE CONDITIONS

Dry, rocky slope	Average number of growth rings last 1/2" of wood	Average number of growth rings last 1" of wood	Average width of last 9 years' growth
Trees killed 1937	15.4	29.6	7.49 mm
Living trees	13.9	24.5	11.95 mm

These data show the slower growing trees being attacked by secondary bark beetles, indicating a lower degree of resistance. The preceding tabulation depicts growth from trees distributed over a rather large area with no concern as to their location except to provide a just comparison. To secure a more direct comparison in the rate of growth of attacked and unattacked trees from the same immediate area increment cores were taken from a group of 10 trees, 5 of which were killed in 1937.

RADIAL GROWTH OF KILLED AND LIVING TREES
FROM THE SAME GROUP

	Average number of growth rings last 1/2" of wood	Average number of growth rings last 1" of wood	Average width of last 9 years' growth
Killed trees	15	29.6	7.49 mm
Living trees	8.8	16	17.30 mm

These data indicate more clearly than the preceding tabulation the susceptibility of slower-growing trees to attacks of secondary beetles.

A startling contrast exists between the growth of trees on dry, rocky exposures and those sites where heavy underbrush indicates better soil and moisture conditions. Cores were taken from ten trees along a dry stream course as representing a much higher site classification than the adjacent slopes.

RADIAL GROWTH OF PONDEROSA PINE
GROWING UNDER DIFFERENT SITE CONDITIONS

	Average number of growth rings last 1/2"	Average number of growth rings last 1" of wood	Average width of last 9 years' growth
Killed and living trees on dry, open rocky slope	14.5	26.6	10.1 mm
Living trees from bottom land at foot of above slope	5.1	9.0	27.0 mm

The above data are self-evident and serve to indicate the importance of soil and moisture in the growing of ponderosa pine.

The data submitted relative to growth have no significance other than to indicate that on dry, open slopes ponderosa pine is now growing under adverse conditions, and that trees of such slow growth are more susceptible to attacks of secondary bark beetles. Though the volume of data secured are sufficient to show general trends, positive conclusions can not be drawn from them.

2. Precipitation

As there is a direct relation between soil moisture and plant

growth, annual fluctuations in precipitation can be considered as an index of tree vigor. Obviously, the past few years of deficient precipitation throughout eastern Montana should have been reflected in tree growth, with an associated reduction in their resistance to bark beetle attack. To determine the existence of such an association, Weather Bureau records from Havre and Big Sandy, Montana have been tabulated as the best information available. It is fully appreciated that the useof these records as depicting conditions on the Rocky Boy Reservation are not above question, as the two Weather Bureau stations are some twelve and twenty miles from the area under consideration. These data presented in the chart attached to this report show a remarkably close relationship between annual precipitation and growth, which is reflected in trees from all sites and exposures. These data have been offered as showing the effects of deficient rainfall as a factor in lowering the resistance of ponderosa pine trees to bark beetle attack. As an annual precipitation of about 14.2 inches is given* as the requirement for ponderosa pine in eastern Montana, it is evident that during the past few years unfavorable growing conditions have existed in this area. As the normal (50 year) precipitation at the Weather Bureau stations used is but about 13.9 inches, there is but little if any margin of safety between maximum and satisfactory growing conditions.

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* Montana Forest and Timber Handbook 1926. United States Forest Service.

3. Logging Practices

The occurrence of abnormal populations of secondary bark beetles often results in primary attacks. Such populations develop through large accumulations of favorable host materials, such as slash, windfalls, stored logs or wood. Fortunately when outbreaks of these beetles occur they are usually short-lived, and by the time the damage is recorded the danger of further destruction has passed. However, if the conditions responsible for the building of the insect population to its aggressive proportions are re-created or continued, further losses should be expected. The severity of the damage associated with such outbreaks is naturally increased when they occur during periods of low tree resistance.

In the Rocky Boy Indian Reservation ponderosa pine logs are cut during winter months and left in the woods for subsequent removal and sawing in May and June. This practice could provide a continuous supply of attractive host material responsible for maintaining the beetle population at an aggressive status. At the time of the writer's examination in June, all logs had been removed from the woods, and all but a few sawed into lumber. Though some of the logs remaining at the mill were heavily infested with Ips oregoni, it was difficult to determine what part the total accumulation of logs had contributed to an increase in the beetle population.

If it is subsequently determined that the method of logging now practiced is a contributing factor to timber losses, modifications would eliminate or materially reduce this danger.

4. Dendroctonus valens Attacks

As the red turpentine beetle (D. valens) develops successfully in freshly cut ponderosa pine stumps, the present aggressive population may be directly related to the existing logging operation. Though this class of host material is preferred, under conditions as have existed within this area for the past few years the attacks of these beetles are often directed to living trees. Though undoubtedly the attacks of this insect contribute somewhat to subsequent bark-beetle infestations, they may not be of great importance except when occurring in areas of low tree resistance.

SUMMARY

These four factors--marginal sites, precipitation, methods of logging, and D. valens attacks--have all contributed more or less to the recent timber losses within this area. No action can be taken to improve poor growing conditions or unfavorable climatic factors; however, if considered necessary, measures could be adopted which would tend to reduce the importance of logging or effects of valens attack. It is believed that with a return to near normal precipitation tree resistance will be restored and further losses from secondary beetles reduced. However, as long as abnormal beetle populations exist there will be some loss of less-resistant trees, and with a return of unfavorable climatic conditions the danger of a serious outbreak. Regardless of other factors, it may prove advisable to adopt precautionary measures

to reduce the beetle population to its lowest point to guard against further devastation.

In view of the factors involved in this problem, the treatment of infested trees as a means of preventing further devastation is not considered as offering a complete solution. Obviously, such action would have some beneficial effects, but under present conditions would not eliminate subsequent losses. In 1937 there were at least three generations of Ips oregoni within the Rocky Boy Indian Reservation. The first attack occurred in late April or early May and originated from overwintering broods, which are mostly adult beetles. This attack was perhaps concentrated in logs and slash. The second generation, which reached the adult stage in June, no doubt directed their attacks to the remainder of the cut material, if any existed, and to living trees, causing the heaviest losses for the season. Later in the season there were a few scattered attacks which no doubt originated from the second generation. However, this loss was of little consequence as compared to that of the preceding generation. The treatment of the infested trees would reduce later attacks of that season, though sufficient beetles would escape the operation to rebuild a destructive population if existing conditions prevailed.

Some indirect measures which might be adopted in the hopes of reducing future losses are as follows:

(1) Dendroctonus valens control. The injection of carbon bisulphide into the brood chamber destroys the broods.

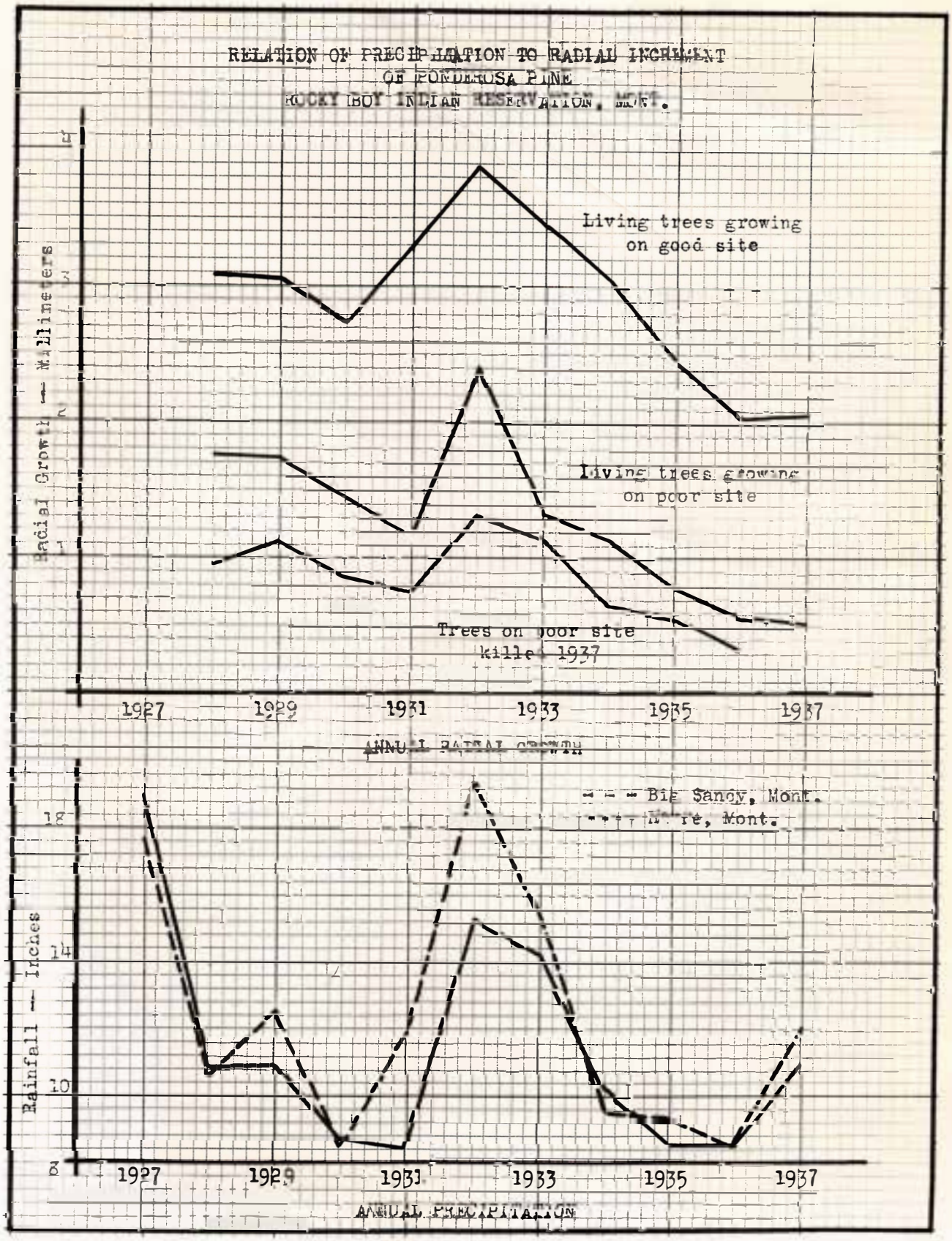
(2) Change in logging practice. Logs cut in late summer and early fall and sawed during the winter would not become attractive host material for Ips attack.

(3) If changes in logging practices are impracticable, all infested logs which are infested with Ips oregoni should be peeled in May prior to the development of new adults.

The writer plans to visit this area in May 1935 and at such other times during the season as may be necessary to secure information which will permit more specific recommendations.

Respectfully submitted,

James C. Evenden
Entomologist


RELATION OF PRECIPITATION TO RADIAL INCREMENT
OF PONDEROSA PINE
ROCKY BOY INDIAN RESERVATION, MONT.
Radial Growth — Millimeters
Living trees growing on good site
Living trees growing on poor site
Trees on poor site killed 1937
1927
1929
1931
1933
1935
1937
ANNUAL RADIAL GROWTH
Big Sandy, Mont.
Havre, Mont.
Rainfall — Inches
1927
1929
1931
1933
1935
1937
ANNUAL PRECIPITATION